

ROENTGEN'S WONDERFUL "X" RAYS

REVIEW OF THE GREAT PHOTOGRAPHIC DISCOVERY.

ROENTGEN'S experiments, followed as they have been by the efforts of other savants along the same lines, together with wide newspaper discussion, have given popular thought and common conversation a tendency toward the scientific and the abstruse. Roentgen rays, X rays, cathode rays, ultra violet

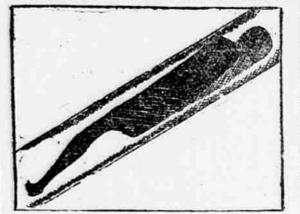


PROF. ROENTGEN.

rays—the words are as familiar to the ear as the alphabet. Stated briefly, Prof. Wilhelm Konrad Roentgen has found a means whereby articles behind opaque substances, or contained therein, may be photographed and their position accurately defined. The pictures thus obtained are light—often shadows only on the plate. Their character is determined by the relative density of the inclosing matter. If the envelope present slight obstruction to the X rays, the impression of the object whose photograph is sought is proportionately distinct. It is easy to see that this discovery may be put to great practical use, and it has for that reason excited an interest almost universal.

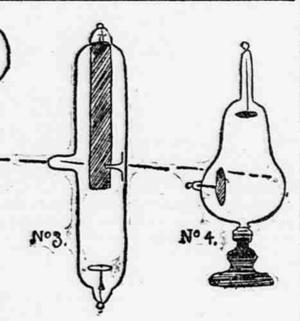
It is difficult to describe the Roentgen discovery and mode of procedure in such terms as may be popularly understood. To photograph any object, of course there must be light. In the Roentgen method this is furnished by what are called Crookes' tubes. In brief, they may be described as glass cylinders from which the air has been partially exhausted. In each end of each tube is placed a disk, one of which conveys an electric current to the interior of the tube and the other carries it away, making the return wire a battery. It is believed that the glass absorbs 95 per cent of the light, so that it is a great point in their manufacture to have

them as thin as possible. Thomas A. Edison makes very thin ones, and he claims that is a point of superiority. He applies the term "fluorescent tubes" to those of his own manufacture. In his experiments he uses two aluminum disks, one representing the anode or positive pole, and the other the cathode or negative pole. The positive or anode disk or electrode is suspended by a small wire close to the mouth or top of the bulb. The cathode or negative disk is fixed in the center of the bulb. It is half an inch



ROENTGEN SILHOUETTE. (Horn-handled razor in its case of cloth covered cardboard. Photographed by A. A. Swinton through a piece of black vulcanized fiber .0212 inch thick.)

known rays—was pursuing a line of inquiry in continuation of a series of experiments by Geissler Gassioit, Hittorf and Crookes. He progressed from the points at which they had stopped, and in later laboratory work in Europe and America



TYPES OF CROOKES' TUBES.

I.—Imported Crookes' Tube. II.—Tube for Experiments in Vacuum. III.—Tube with Which Edison Will Make the Brain Photograph. IV.—Edison's Ordinary.

it is found that the results obtained by Roentgen have been improved upon. The earlier explorers in this field regarded the rays as proceeding directly from the cathode. Roentgen holds otherwise. He confesses himself at somewhat of a loss to describe these rays and their full properties, but is confident that they do not proceed directly from the cathode, but issue only from that part of the Crookes' tube where the cathode rays strike the glass wall. It is as if the true cathode rays were decomposed, and those which Prof. Roentgen denominates the X rays pass on, while the other components of the cathode rays are exhausted or absorbed in the glass. In the earlier experiments—early is used in a relative sense only, as all this Roentgen information measures its existence by weeks—in the first attempts at the new photography, it was necessary to expose the plates for a long time, more than an hour in some instances. Before any results were produced. The perfection of the appliances kept pace with the interest of the subject, and Prof. Wittman, of the high school at Buda Pesth, has reduced the time necessary to obtain a well-defined Roentgen photograph to three minutes under ordinary circumstances, and thirty seconds under perfect conditions.



WILLIAM CROOKES. Famous inventor of the Crookes tube.

in diameter and is placed on an angle as if intended to act as a reflector. "The generation of the light," says Mr. Edison, "takes place when the proper fluorescence is obtained within the tube, and it is caused by the action of the electric fluid in disturbing the molecules of rarefied air. The cathode disk does not make the light, but propels it with great force against and through the glass of its prison and anything else that may intervene between it and the sensitive plate which is to register its rays."

With the Crookes' tube at hand and with a battery containing enough electricity to last during the experiments, the scientist now devotes his attention to the securing of a sensitive plate which will register an image of the object to be photographed. So far, the ordinary dry plates used by an amateur or professional have been used with success. The unexposed plate is put in a dry plate holder. This furnishes protection from the daylight. Any article which it is desired to secure an image of is procured. All the light is shut out from the laboratory, or wherever the experiment is to be made. The proper wire connections are made with the battery and tubes. Directly under the glass is placed the dry plate, still in the holder. It is unnecessary to draw the slide, for the X rays will penetrate wood or steel as readily as they will pass through a piece of glass. Between the glass and the dry plate is placed the ob-

ject to be photographed. It is laid on the side of the holder. Lenses or reflectors are unnecessary, as will be explained later. When everything has been placed carefully, and all is ready, the electric current is flashed on. For a moment it creeps along the tube and flares up. Soon it becomes steady, and its rays spread out upon the image. Down through the envelope the rays fall. They cut their way through every fiber straight down until they fall upon the sensitive plate and register their passage. If an object, such as a bone or piece of metal stands in the way, then, and only then, do they pause and their interruption is shown by the delicate plate being unaffected. If a bullet is imbedded in the flesh, and here is where the first practical benefit to surgery has been found by the new art, the impression is left. The time of exposure varies. When it has been sufficiently exposed the current is shut off and the plate taken to the developing room. There the process used by any amateur is carried out. The plate is first developed in the ruby light, and it is then "fixed" with hyposulphite of soda. It can then be exposed to daylight without any fear of being changed. The negative, if the experiment has been a success, will show a thin outline of the enveloping medium and a lighter shade for the article whose photograph or shadow is desired. It will be understood that in the developed work the conditions of the negative are reversed, the inclosing substance is represented in the lighter shade, the interposed denser object in the darker.

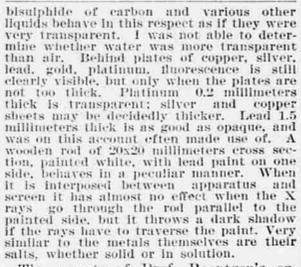
Prof. Roentgen, when he ascertained the effects producible by the X—the un-



PHOTOGRAPH OF SHOT IN RAT'S BODY.

foil is scarcely noticeable; only after several hours have been laid on top of each other is a shadow clearly visible on the screen. Thick blocks of wood are also transparent; in planks two or three centimeters thick are but slightly opaque. A film of aluminum about fifteen millimeters thick weakens the effect very considerably, though it does not

entirely destroy the fluorescence. Several centimeters of vulcanized India rubber let the rays through. Glass plates of the same thickness behave in a different way, according to the way they contain lead (thin glass) or not; the former are much less transparent than the latter. If the hand is held between the discharge tube and the screen the dark shadow of the bones is visible within the slightly dark shadow of the hand. Water,



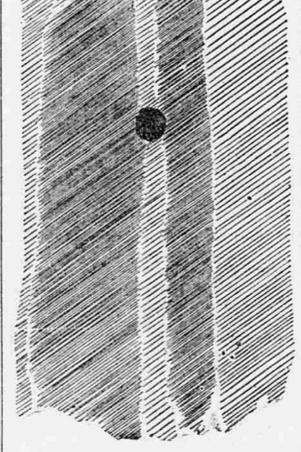
A COIN, AN AWL, AND A CHISEL. Photo by Dr. Miller, Toronto.

bisulphide of carbon and various other liquids behave in this respect as if they were very transparent. I was not able to determine whether water was more transparent than air. Behind plates of copper, silver, lead, gold, platinum, fluorescence is still clearly visible, but only when the plates are not too thick. Platinum .02 millimeters thick is transparent; silver and copper sheets may be decidedly thicker. Lead 1.5 millimeters thick is as good as opaque, and was on this account often made use of. A wooden rod of 20x20 millimeters cross section, painted white, with lead paint on one side, behaves in a peculiar manner. When it is interposed between the apparatus and screen it has almost no effect when the X rays go through the rod parallel to the pointed side, but it throws a dark shadow if the rays have to traverse the point. Very similar to the metals themselves are their salts, whether solid or in solution.

The reports of Prof. Roentgen's experiments produced a great activity among students everywhere. Newspapers and scientific journals were filled with reports of the labors and new discoveries made. There is not an institution of learning or a laboratory worthy the name in America where the Roentgen method of photography has not been put to practical test. One remarkable discovery was made incidental to some experiments in New York. Prof. Max Ostentberg, of Columbia College, desiring to photograph the framework of a mouse, drowned the creature in a bucket of water. The animal remained under water fifteen minutes after it had ceased to struggle. It had been effectively dead more than an hour when the apparatus was finally arranged. It was laid upon the plate and subjected to the powerful rays from the Crookes' tubes, and after an hour of exposure revived sufficiently to struggle to its feet and crawl about the plate. Naturally this phenomenon excited much interest, as a new quality of the Roentgen rays was disclosed. The possibilities of benefit to humanity in case the rays are found upon further examination to possess the revivifying power are vast.

Edison, the wizard, has plunged enthusiastically into the new study, and has largely invented his own apparatus. The Crookes' tubes, he thought, dissipated too much of the new energy and he made some for himself. They are thinner and give better results. Prof. A. W. Wright, of Yale, is one of the most hard-working scientists who has entered into the new department of research, and has strikingly confirmed all of Roentgen's experiments. Prof. Wright's experiments were made with a great variety of substances, and it was found that strong impressions were obtained upon a photographic plate, even when it was inclosed in an opaque wrapping of black paper and covered with a pine board half an inch thick.

Prof. Henry A. Bunstead, of the Sheffield School at Yale, has also ardently pursued the investigation of X rays along with Prof. Wright. Mr. Bunstead has experimented on several animals. He first took a mouse, and the photograph shows the skull quite clearly, but the bones are



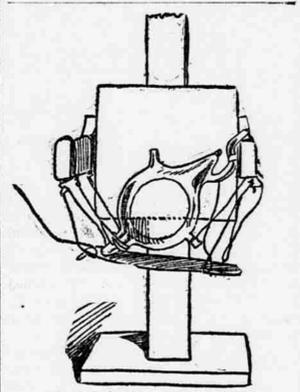
PRACTICAL TEST OF THE X RAY. (Photograph taken by Professor Cox, of Montreal, showing where a bullet was lodged, which has been extracted from the leg of a man who was shot on Christmas Day.)

not at all well brought out. With a fish and a frog Mr. Bunstead also obtained good results. The backbone of the fish is easily distinguishable, as is also the bladder. In the frog the leg bones are clearly visible. Mr. Bunstead obtained good photographs of coins in a heavy leather case. The coins were mixed in with a lot of visiting cards and the case was placed beneath a pine board an inch thick. He also obtained a good photograph of a pair of eyeglasses, placed beneath a board, and of the kernels of English walnuts. All these experiments were made in broad daylight, and the exposure of the negative lasted about an hour in each instance.

Prof. Rike and Dr. Miller, of Toronto, together with others, have made careful experiments. They have photographs clearly defining the bony structure of the frog and another showing the ease with which X rays penetrate wood. A coin, a Bradawl and a chisel were exposed. The tang of the awl where it enters the wood can be traced easily. The wood is in half shadow. Prof. Eugene Haanel, of the

Syracuse University, had marked success in photographing the interior of a frog. Prof. Haanel and other scientists of degree predict that Edison's attempt to photograph the brain will never prove successful. They think he may get the interior line of the skull, but the brain, being less dense, will not furnish a sufficient resistance to the rays.

What of Roentgen, and how did he make his great discovery? He has a chair in the department of physics in the Wurzburg University. A short time ago he was unknown except to his fellow inquirers into the phenomena and laws of natural philosophy. This discovery was brought about by pure accident. Prof. Roentgen, while experimenting in a dark room with a Crookes' tube, through which an inductive electric current was passed, was greatly astonished to find that a photographic plate inclosed in wooden slides which had been lying in the same room, revealed some strange impressions which could not possibly be attributed to the influence of ordinary light from without. Struck with the curiousness of this phenomenon, for which no possible reasons seemed to exist, Prof. Roentgen experimented again under exactly the same conditions and found that the photographic plate could have been reached only by a light which was capable of penetrating wood, a substance which hitherto has always been considered opaque. Further trials showed not only that such light existed and was generated in a Crookes' tube, but that it possessed the faculty of penetrating many other substances, such as organic tissues, paper, etc., while certain metals and bone substances (calcium phosphate) did not lose their opacity. Prof. Roentgen further succeeded in obtaining photographic impressions of metallic objects which had



CROOKES' TUBE IN POSITION.

been inclosed in a wooden box, and also of the skeleton of a living hand. Then he gave his findings to the world.

WHY HE TOOK THE SEAT.

A Touching Scene Witnessed on a New York Car.

A pathetic incident occurred in a Broadway cable-car one evening recently. Two men boarded the car at Chambers street. They were broad-shouldered, athletic looking men, and one familiar with professional athletes would have recognized in one a ball player, well known in the National League, and the other a well-known prize fighter. The men were chatting and did not pay much attention to the way they were jostled as the car filled up rapidly. It was early in the evening and the theater crowd was moving.

At 14th street the car stopped and two young women got on. They were handsomely dressed and had a general look that would cause one to take them for actresses. They were at once recognized by the men mentioned. The two men sprang to their feet and greeted the young women warmly. The car was filled, and many were standing. Just as the pugilist got on his feet a man who was standing pushed a friend gently into the seat just vacated. The pugilist turned angrily and laid a strong hand upon the man who had just seated himself and said in a firm voice:

"Excuse me, sir, I meant that seat for this lady."

It looked ominous to those who saw the gleam in the eye of the pugilist. The man addressed said hastily:

"I beg your pardon. Excuse me." Even as he spoke he was trying to rise, but as he did he felt in front of him in uncertain manner. The pugilist looked searchingly into his face, and then caught him by the shoulder, firmly, but gently, and pushed him back into the seat, saying:

"That's all right, old man; you keep the seat."

Then he turned to the young woman and said quietly:

"You'll have to stand, Blanche, the poor chap's blind."—New York Tribune.

Clean Stables.

Start into the winter with clean stables, and keep them in that condition. We always hear that stock of all kinds are more liable to contract disease in winter than summer, and no doubt many ills that stock contract in winter may be traced to filthy stables and bad ventilation. Clean stalls and good bedding make stock healthy.

The North Kingdom.

Norway is more properly Norea, meaning "North Isle." It is called by the natives "The North Kingdom."

Mrs. Wickwire—You don't know what a grief it is to have a husband who thinks he is funny. Mrs. Watts—What is the trouble dear? "I asked him last evening to bring home some good up-to-date literature and he brought a bundle of almanacs."—Indianapolis Journal.

Mr. McCann—I am building a house and am only using lumber from the zero forests of Michigan. Friend—Why so? Mr. McCann—Because trees that can stand zero all winter ought to make a warm house, so they ought.—Truth.

Why should older people be compelled to be childish, and play with dolls at Christmas?

OF A GREAT STATE

NEWS FROM ALL PARTS OF NEBRASKA.

The State Auditor Reports a Decrease of Over \$9,000,000 in Mortgaged Indebtedness for 1895—Farmers Getting Out of Debt.

Mortgaged for Millions.

State Auditor Moore has completed the record of the mortgage indebtedness of Nebraska for the year ending December 31, 1895. The total farm, town and city and chattel mortgages filed for that year show a decrease of \$9,183,977.04 from that of the year of 1894. To offset this, however, there is a corresponding decrease in the total amount of satisfactions, the satisfactions of farm, town and city and chattel mortgages for 1895 being \$9,289,774.28 less than for the same period in 1894. The total decrease of farm mortgages is \$4,118,922.75; total decrease of chattel mortgages, \$3,287,287.62. In town and city mortgages for 1895 there is a decrease of nearly \$2,000,000, and a corresponding decrease in the amount of satisfactions. The number of sheriff's deeds and other deeds in foreclosure are about the same for the two years.

HEAVY FALL OF SNOW.

Two Inches Reported in Many Sections of the State.

Irvington, Feb. 29: Two inches of snow have fallen since last evening, with indications of more. Ground in fine condition to receive it.

La Platte, Feb. 29: Sarpy County was treated to a snowfall of two inches today. The moisture was needed.

Fremont, Feb. 29: Nearly two inches of snow fell here last night and this morning. It was very damp.

Bennington, Feb. 29: Fully three inches of snow fell here last night and today, it being the first snow of any consequence this winter.

Wahoo, Feb. 29: About two inches of snow fell here this morning and indications are that more will fall to-night.

Dunbar, Feb. 29: Snow commenced falling here about 4 o'clock and continued all forenoon, with prospects of lasting all day.

Ord, Feb. 29: All day yesterday a furious storm of wind was raging from the northwest, and to-day there are indications of snow.

North Bend, Feb. 29: The first snow in this vicinity since December 1 commenced this morning.

Weston, Feb. 29: A fine shower fell last night, followed by a fall of six inches of snow. This moisture was much needed, as the ground was very dry and dusty. Some of the farmers in this locality have finished sowing wheat, and the rain and snow last night puts the soil in a most favorable condition.

Pera, Feb. 29: Snow to the depth of four inches fell here last night and it is still snowing.

Plattsmouth, Feb. 29: A heavy snow commenced falling at an early hour here this morning and continued steadily until noon, when the snow slacked up and a heavy mist set in. Winter wheat has a stand never heard of here before. The ground seems in splendid condition, the moisture extending down as deep as eighteen inches. The creeks through this county that have been dry all summer and fall have, for some unknown cause, began sending a clear current of water along their dusty banks.

Fort Calhoun, Feb. 29: Snow fell last night in this vicinity to the depth of about two inches no wind accompanying.

Selling Fire Water to Indians.

On complaint of United States Indian Agent Clements of Santee Agency, Deputy United States Marshal Tomlinson arrested Adam Farestor, proprietor of the brewery at Niobrara, on the charge of selling beer to Indians. He had his hearing before the United States Commissioner who bound him over to the United States district court in the sum of \$300, which he secured. There has been for the past two years a reckless liquor traffic going on with the Indians, the claim having been that the Indians having had their lands allotted to them, and are voters, are free to drink if they see fit. A test case is talked of this point never having been fully settled. There is considerable unpleasantness about it, since the fines have been but nominal and the bootlegging and liquor traffic have continued for a quarter of a century without any let up.

Buildings Burned at Arapaho.

At Arapaho fire destroyed the Bennett block, the Reynolds block, and a small one-story frame building. The fire originated in Dean's drug store in the Bennett block. His loss on stock is about \$3,000 to \$4,000, with \$2,000 insurance. A Mr. Hill's family, who lived up stairs, lost its entire house furnishings, including all-wearing apparel. There was no insurance on the Reynolds building. There was a slight loss on the drug stock, with \$500 insurance on the building. On the Bennett block there was no insurance.

Two Girls Collide with a Car.

Misses Shickley and Mills, young unmarried women, residing at Lincoln, had a narrow escape from death on the street car track. In company with another young woman from Grand Island, they tried to cross the track in front of an approaching car. Misses Shickley and Mills lost their heads, ran back and forth and were struck and knocked down by the car. They both suffered severe scalp wounds and bruises about the body, but will recover.

Misrepresenting Nebraska.

Frequent reports are received from the eastern and middle states that persons are soliciting aid for Nebraska sufferers and making deplorable statements about existing want and destitution. The representations are untrue, and the solicitors are almost without an exception impostors and are acting without proper authority. The secretary of the State Board of Agriculture has made exhaustive inquiries throughout the state and ascertained that no relief is needed.

Abolish Terminal Charges.

The first step of the railways toward satisfying Nebraska cattle shippers was taken when the Missouri Pacific withdrew all terminal charges at the Omaha stock yards. This has been a great source of trouble, as shippers thought it unjust. The Rock Island also abolishes terminal charges.

Given Membership in A. R. A.

The Cass County Agricultural Society has been given membership in the American Rearing Association, and is making great preparations for the races to be held at Plattsmouth in September.

Terrible Trip of a Woman.

A few days ago as Mr. and Mrs. Philip Gleich, who live near Doniphan, were returning home, their team became frightened and upset the buggy. Mr. Gleich was thrown out on his head and shoulders and sustained a few slight bruises, but Mrs. Gleich was less fortunate. Her foot and knee became entangled in the wheel and she was dragged for a distance of one and one-half miles and crossing seven bridges over the hard rough oak planks. Every particle of clothing was torn from her body and her entire body is covered with bruises. Both limbs and abdomen were lacerated and bruised, but impossible as it may seem, no bones were broken. The worst injuries are internal. During the entire trip she remained conscious. The team, after running this distance, ran into a barbed wire fence, throwing one of the horses and holding him fast.

This was near the residence of a Mr. Gallagher. He hearing the struggling horses, went out to investigate. She was then unconscious and was carried into the house and a physician called.

Stamford Citizens Indignant.

The citizens of Stamford and vicinity have become very indignant over the matter of some parties living near that place who are continually writing to Iowa and Illinois for aid, claiming that their families are destitute and in a starving condition. It is said these parties are known and if they do not desist sending such libelous and misleading letters to other states for the sake of personal gain they will be prosecuted. That part of Nebraska has plenty to spare this year without soliciting aid.

Litigation Over a Wrecked Mill.

At a special session of the district court at Bloomington the most important matter to come up is the Franklin mill case. Last spring, during the high water, the dam was washed out and the mill fell into the river. Nothing was done toward getting it out until a month ago, when the judge appointed a receiver. The property was sold at auction and now the numerous judgments and mortgages come into court all claiming first right.

Norfolk Gets the Trophy.

The Governor's Cup, which created so much trouble in state militia circles the last encampment, has been made the subject of a general order by Gen. Barry. Under the order the cup is to be delivered to the Moore rifles at Norfolk in accordance with the award made at Hastings. The rifles are in good shape to retain the trophy, and as soon as their new armory is built will have the very best facilities for drilling.

Seeding Well Advanced.

A little over three inches of snow has fallen in the vicinity of Holdrege the past week. The ground there was in good condition before, and this wet it down so that small grain will sprout and grow without any moisture for some time. Quite a good deal of seeding has been done already, the ground in all instances being in a very fine condition; in fact it is in the best condition that it has been since 1892.

Awful Death of a Farmer.

While Peter Stenberg, a farmer living nine miles west of Stromsburg, was cutting corn stalks, the horses he was driving became unmanageable, and in the runaway Stenberg fell in front of the cutter and became entangled in the knives and was horribly mangled. When the horses were stopped by neighbors it required some fifteen minutes to extricate the body from the machine. He lived but a few minutes after being released.

Omaha Canal Knocked Out.

The supreme court has disposed of what is known as the Omaha canal case. By the terms of the opinion the act of the legislature of last winter, under which it was sought to submit a proposition for the voting of bonds, is declared null and void. The opinion was written by Commissioner Ryan, concurred in by Justice Norval and Harrison, Commissioner Irvine not sitting, and Chief Justice Post dissenting.

Frozen to Death While Injured.

Coroner Holyoke of Lincoln held an inquest over E. G. Johnson near Martel, whose body was found in the public road. The investigation disclosed the fact that he was moving his household goods and was thrown from his wagon. He was stunned by the fall and expired from the cold.

Pupils Given a Score.

While the chemistry class was experimenting in the Bloomington high school laboratory with acid, a scholar applied a match to one of the tubes and an explosion followed. Prof. Bowers was badly cut in the face and considerable damage done to the laboratory.

Death Sentence Commuted.

Gov. Holcomb has commuted the death sentence of John B. Walker, the Dawson County murderer, to imprisonment for life.

Nebraska News Notes.

J. F. Bradshaw has succeeded J. T. Miller as postmaster of Superior.

Tramps burned a Union Pacific box car at Central City.

Gustav Anderson of Bellevue was fined \$10 and costs for whipping his aged mother.

A young Cass County farmer lost \$400 in the gambling joints of South Omaha recently.

Fred Worfel of Hastings has been adjudged insane and sent to the asylum at Lincoln.

Lake Quinnebaug, near Tekamah, is threatened with annihilation by the Missouri River.

Thousands of dollars worth of hay was destroyed by the overflow of the Platte River, caused by the ice gorge at Schuyler.

Samuel Sanders, who owns a large farm west of Plattsmouth, marketed two porkers, the combined weight of which was 1,365.72.

Central City people object because the Union Pacific fast mail passes through their town at the rate of fifty miles an hour.

Albert and Norton Askerman, young boys of Council Bluffs, were arrested Sunday at Ashland, charged with burning a house in Iowa.

H. F. Hubbard, a commercial man of New York City, died suddenly in a Nebraska City hotel.

A tin box filled with gold dust, valued at \$300 was uncovered by William Austin while digging a foundation for his home near Plattsmouth.

William Grim, who mysteriously disappeared from Bellevue last summer, and who it was thought had committed suicide, has turned up in Chicago.

Veteran soldiers of Holt, Brown, Rock, Keya Paha and Boyd Counties will hold a reunion at a date to be fixed at the meeting of a committee at Long Pine on June 3.